Registration No. : | | | | | | | | | | |

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B. Tech

HSSM 3302

Fifth Semester Regular Examination – 2014

OPTIMIZATION IN ENGINEERING

BRANCH(S) : AEIE, CHEM, EC, ETC, IEE

QUESTION CODE : H 210

Full Marks – 70

Time : 3 Hours

*Answer Question No. **1** which is compulsory and any **five** from the rest.*
The figures in the right-hand margin indicate marks.

1. Answer the following questions : 2 ×10

(a) Explain degeneracy in L.P.P.

(b) Write the difference between dual simplex and simplex algorithm.

(c) Explain the role of duality in linear programming.

(d) Explain various steps involved in solving a transportation problem by applying the North West corner rule.

(e) Show that assignment model is a special case of transportation model.

(f) Explain the single channel and multi channel queueing models.

(g) Write the transition diagram for M/M/3/3 model.

(h) What are the primary uses of Kuhn-Tucker necessary and sufficient conditions ?

(i) What is the advantage of Golden search method over Fibonacci search method ?

(j) What are the basic advantages of genetic algorithm.

P.T.O.

2. (a) Solve the following LPP using simplex method : 5

Minimize $Z = 4x_1 + 8x_2 + 3x_3$

subject to $2x_1 + x_2 \geq 2$

$2x_1 + x_3 \geq 5$

$x_1, x_2, x_3 \geq 0$

(b) In a LPP : 5

Minimize $Z = 3x_1 + 5x_2$

subject to $x_1 + x_2 \leq 1$

$2x_1 + 3x_2 \leq 1$

$x_1, x_2 \geq 0$

Obtain the variation in c_j $(j = 1, 2)$ which are permitted without changing the optimal solution.

3. (a) Using duality, solve the following : 6

Minimize $Z = 5x_1 - 2x_2 + 3x_3$

subject to $2x_1 - 2x_2 - x_3 \geq 2$

$3x_1 - 4x_2 \leq 3$

$x_2 + 2x_3 \leq 5$

$x_1, x_2, x_3 \geq 0$

(b) Customers arrive at a sales counter managed by a single person, according to a Poison law with a mean rate of 20 per hour. The time required to serve a customer has an exponential distribution with mean of 100 seconds. Find the average waiting time of a customer. 4

4. Using revised simplex method to solve the following LPP : 10

Maximize $Z = -2x_1 - 4x_2 - x_3$

subject to $x_1 + 2x_2 - x_3 \leq 5$

$2x_1 - x_2 + 2x_3 = 2$

$-x_1 + 2x_2 + 2x_3 + x_4 \geq 1$

$x_1, x_2, x_3 \geq 0$

5. (a) Solve the following Transportation problem to maximize the profit : 5

Origin/Source	A	B	C	D	E	Availability
1	3	4	6	8	9	20
2	2	10	1	5	8	30
3	7	11	20	40	3	15
4	2	1	9	14	16	13
Demand	40	6	8	18	6	

(b) The company X has four plants each of which can manufacture any one of the four products. Product costs differ from one plant to another as follows :

		Product			
		1	2	3	4
Plant	1	42	35	28	21
	2	30	25	20	15
	3	30	25	20	15
	4	24	20	16	12

Find out which product each plant should produce to minimize cost. 5

6. (a) If a factory maintains an average in-process equivalent to 300 work orders or jobs and an average job spends 6 weeks in the factory. What is the production rate of the factory in units of jobs per year ? 5

(b) Use the Golden section search method to minimize the function : 5

Min $f(x) = 3x^4 + (x-1)^2$, $0 \leq x \leq 4$.

7. Solve the quardratic programming problem : 10

Maximize $f(x) = x_1^2 - x_1x_2 + 3x_2^2 - 4x_2 + 4$

subject to $x_1 + x_2 \leq 1$

$x_1, x_2 \geq 0$

8. Write notes on the following : 5×2

(a) Markovian Queueing Model

(b) Fibonacci search method.